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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/695,710	10/29/2003	Lung T. Tran	10017427-1	5581
22879	7590	04/18/2005	EXAMINER	
HEWLETT PACKARD COMPANY P O BOX 272400, 3404 E. HARMONY ROAD INTELLECTUAL PROPERTY ADMINISTRATION FORT COLLINS, CO 80527-2400			HO, TU TU V	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/695,710

Applicant(s)

TRAN ET AL.

Examiner

Tu-Tu Ho

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 September 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 13 and 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 15 and 16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 10/29/2003 is acceptable.

Election/ Restriction

- 2 Applicant's election without traverse of Species IA within elected Invention I (**claims 1-12 and 15-16**), in the reply filed on 09/27/2004 is acknowledged. Although Applicant did not provide a listing of the claims readable on the elected species, all elected claims within Invention I are readable on the elected species.

3. **Claims 13-14** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

Election was made **without** traverse as noted above.

Drawings

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: bottom conductor layer **122** (paragraph [0031]). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should

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be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 122' (Fig. 4B). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

6. The disclosure is objected to because of the following informalities: paragraph [0028], "107 Ω - μm^2 " should be "10⁷ Ω - μm^2 "; paragraph [0032], "bit line 106" should be "word line 106". Appropriate correction is required.

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. **Claims 9-12 and 15-16, and 1-8** are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-10, and 11-19 of U.S. Patent No. 6,541,792 (the '792 patent). Although the conflicting claims are not identical, they are not patentably distinct from each other. Claims 9-12 and 15-16 of the present invention is a similar version of the claimed invention in claims 1-10, and claims 1-8 of the present invention is a similar version of the claimed invention in claims 11-19 of the above-identified U.S. Patents with similar intended scope.

With respect to the limitation "a dielectric breakdown voltage of between 2 and 3 volts" of claims 12 and 16, a dielectric breakdown voltage of between 2 and 3 volts is known and available, i.e., it is within the skill of an artisan to decrease the thickness of the dielectric layer, and decreasing the thickness of a dielectric layer to lower the breakdown voltage of the dielectric layer is a universal knowledge, and it is further within the skill of an artisan to decrease the thickness of the dielectric layer, through routine experimentation, until a breakdown voltage of between 2 and 3 volts is obtained.

With respect to the limitation “isolator element”, the claims of the ‘792 patent recites “the second tunnel junction”.

With respect to the limitations “the average thickness of the barrier layer is between 10 and 30 angstroms”, the average thickness of the barrier layer between 10 and 30 angstroms is known to be feasible in the art (to achieve thinner thickness, and thus less power consumption and more economical appealing), see for example Ishihara et al. US-PAT-NO 5299151, column 1, lines 15-40, which discloses a barrier layer of 10-50 angstroms, or Porter PGPUB-DOCUMENT-NUMBER 20040169254, claim 5, which claims a barrier layer thickness of approximately 10-100 angstroms (1-10 nm).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. **Claim 9** is rejected under 35 U.S.C. 102(b) or 102(e) as being anticipated by Raberg U.S. Patent Application Publication 20030132468 (the ‘468 publication).

According to the reference, the non-uniformity (“roughness”) of a barrier layer of a (magnetic) tunnel junction in the art (“prior art”, Fig. 3) is a natural occurrence (paragraph [0030]).

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In particular, the reference discloses a tunnel junction for use in a memory element, comprising:

a bottom conductor (20, which is the magnetic hard layer, which is a (magnetic) metal and is conducting and is therefore a conductor, or a bottom electrode - not shown - but must be present for the device to function) comprising an upper surface;

a top conductor (16, which is the magnetic soft layer, which is a (magnetic) metal and is conducting and is therefore a conductor, or a top electrode - not shown - but must be present for the device to function);

a barrier layer (18) disposed between the bottom conductor and the top conductor; and wherein the barrier layer comprises a non-uniform surface (as shown in the figure and as detailed above).

Claim Rejections - 35 USC § 102 and § 103

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 1-2 and 9 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lee et al. U.S. Patent Application Publication 20040174740 or rejected under 35 U.S.C. 102(e) or 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Lu et al. U.S. Patent 6,816,431.

Except for differences in terminology, Lee Discloses a resistive cross point array memory device (MRAM) as claimed. Instead of calling conducting lines 19 and 17 as word line and bit line as claimed, Lee terms the conducting lines bit line and digit line (paragraph [0006]). However, the limitations are anticipated if one in the art interprets the conducting lines broadly, or obvious because it would be within a skill of an artisan to modify the structure of Lee such that a digit line becomes a word line.

More importantly, Lee discloses the main feature of the claimed invention, “the bottom conductor comprises a non-uniform surface”. In particular, Lee discloses a resistive cross point array memory device, comprising:

- a plurality of conducting lines (17 or 19, only each of which is shown, Fig. 1) extending in a first direction;

- a plurality of conducting lines (19 or 11, only each of which is shown) extending in a second direction such that a plurality of cross points (only one is shown, but it is unlikely for the MRAM to have only one cell, or it would be easy for an artisan to add more cells) is formed at intersections between the word and bit lines;

- at least one memory element (16) formed in at least one of the cross points, the memory element comprising a first tunnel junction, the first tunnel junction comprising a bottom conductor (1 or 1/17), a top conductor (15 or 15/19), and a barrier layer (9, “tunneling barrier”) adjacent the bottom conductor; and

- wherein the bottom conductor comprises a non-uniform upper surface (paragraph [0010]: “high degree of surface roughness”).

Except for the appear-to-be inherency of the non-uniformity of the upper surfaces of the various layers, Lu discloses a resistive cross point array memory device (MRAM, Figs. 1A and 1B) as claimed. In particular, Lu discloses a resistive cross point array memory device, comprising:

a plurality of word lines (WL) extending in a first direction;

a plurality of bit lines (BL) extending in a second direction such that a plurality of cross points is formed at intersections between the word and bit lines;

at least one memory element (100) formed in at least one of the cross points, the memory element comprising a first tunnel junction, the first tunnel junction comprising a bottom conductor (ML or ML/WL), a top conductor (ML or ML/BL), and a barrier layer (TL) adjacent the bottom conductor; and

wherein the bottom conductor comprises a non-uniform upper surface, per the interpretations of artisans Raberg, Lee, as detailed above, or Drewes (PGPUB-DOCUMENT-NUMBER: 20030228710, paragraph [0008]).

The bottom conductor ML/WL of the prior art resistive cross point array memory device further comprises one of the word lines (WL) and the top conductor ML/BL of the prior art resistive cross point array memory device further comprises one of the bit lines (BL).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tu-Tu Ho
April 13, 2005